Cluster neurons

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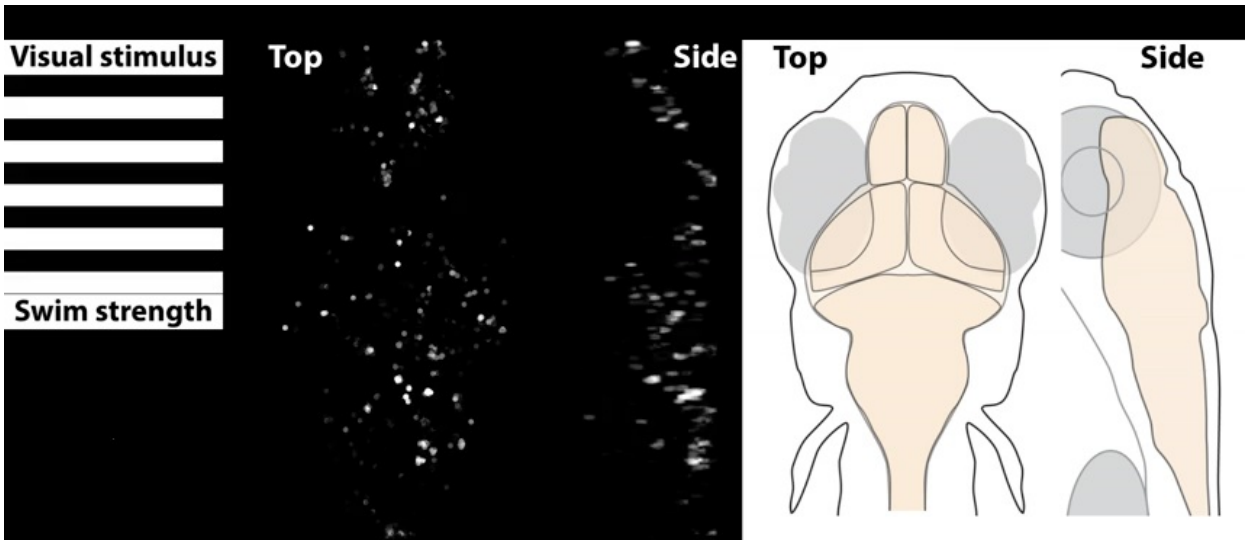
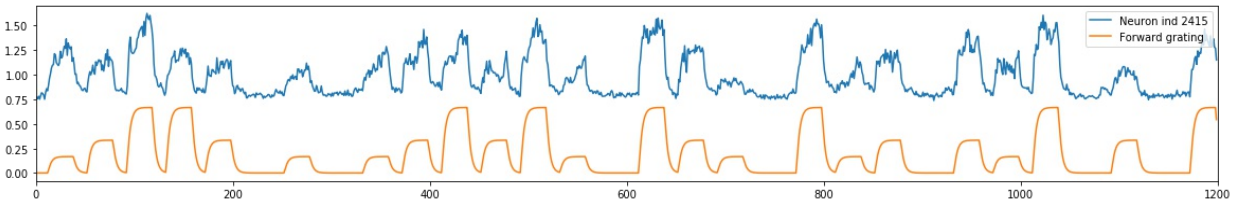
Neurons show different responses to behavioral variables



Neurons show different responses to behavioral variables



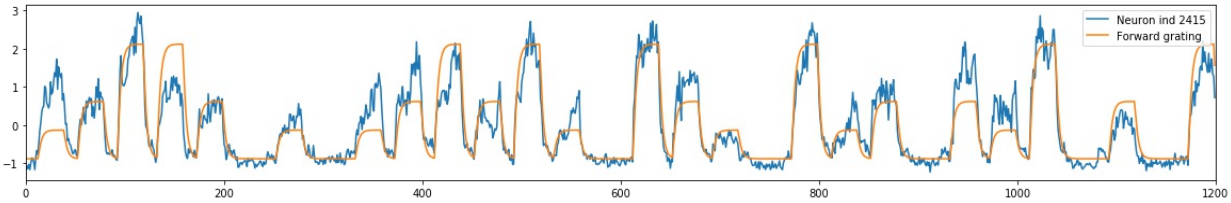
- The neural response is at the different dynamical range from the forward grating. How to unify them?
- The neural response seems highly modulated by the forward grating. How to measure the level of the modulation?
- How to compare the neural response to different contents of behavioral variables, such as gratings and swim?

Unify the data -- z-score

The neural response is at the different dynamical range from the forward grating. How to unify them?

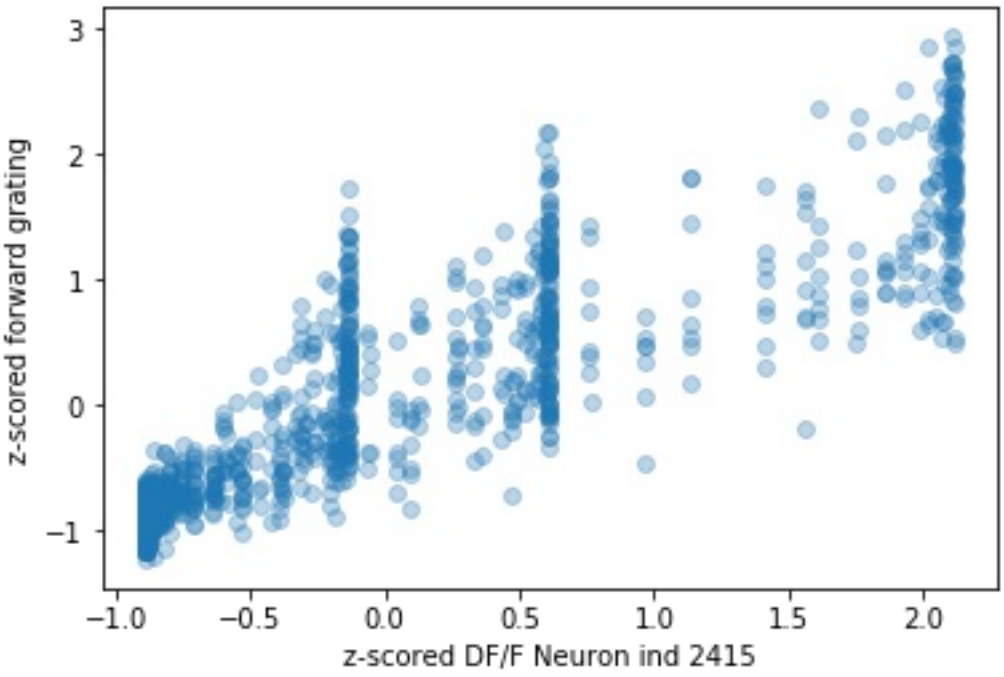
$$z = \frac{x - \mu}{\sigma}$$

- write your own function of z-score
- find existing funciton in matlab doing z-score
- do exercise 3.1 and 3.2



Find relations between a behavioral variable and a neural response -- scatter plot

The neural response seems highly modulated by the forward grating. How to measure the level of the modulation?



Quantify the linear relations between a behavioral

variable and a neural response -- correlations

The neural response seems highly modulated by the forward grating. How to measure the level of the modulation?

$$\rho_{X,Y} = \frac{\operatorname{Cov}(X,Y)}{\sigma_X \sigma_Y} = \frac{E[(X-\mu_X)(Y-\mu_Y)]}{\sigma_X \sigma_Y}$$

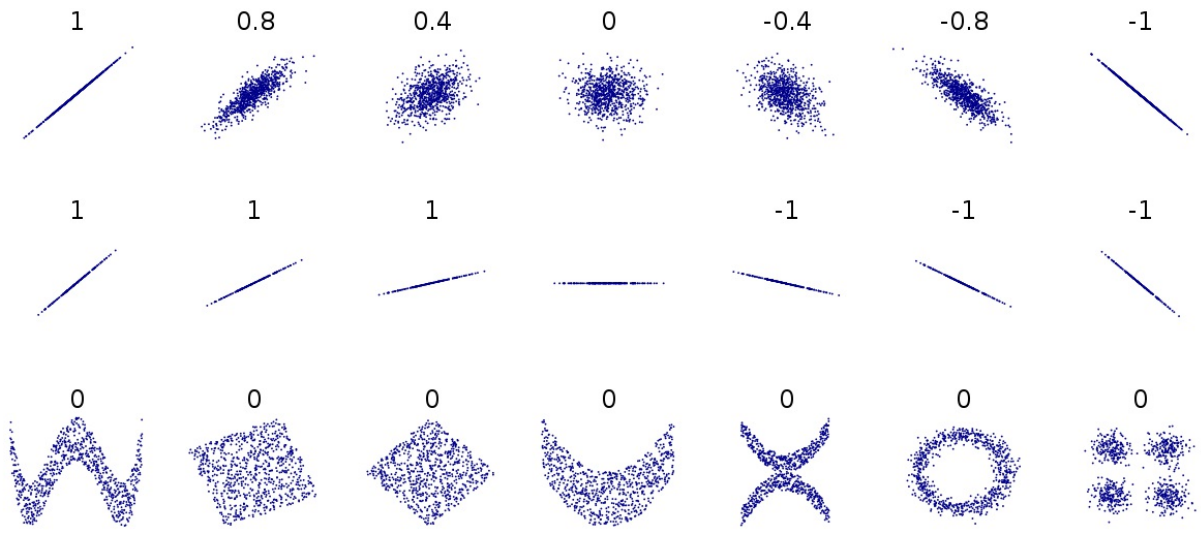
- write your own function of Pearson's correlation ρ
- find existing function in matlab doing Pearson's correlation
- compute correlation to a single behavioral variable (exercise 3.3)
- compute correlation to different behavioral variables (exercise 3.4)
- **create correlation map across the whole brain** (exercise 3.5)

* Discussion: Quantify the relations between a behavioral variable and a neural response

The neural response seems highly modulated by the forward grating. How to measure the level of the modulation?

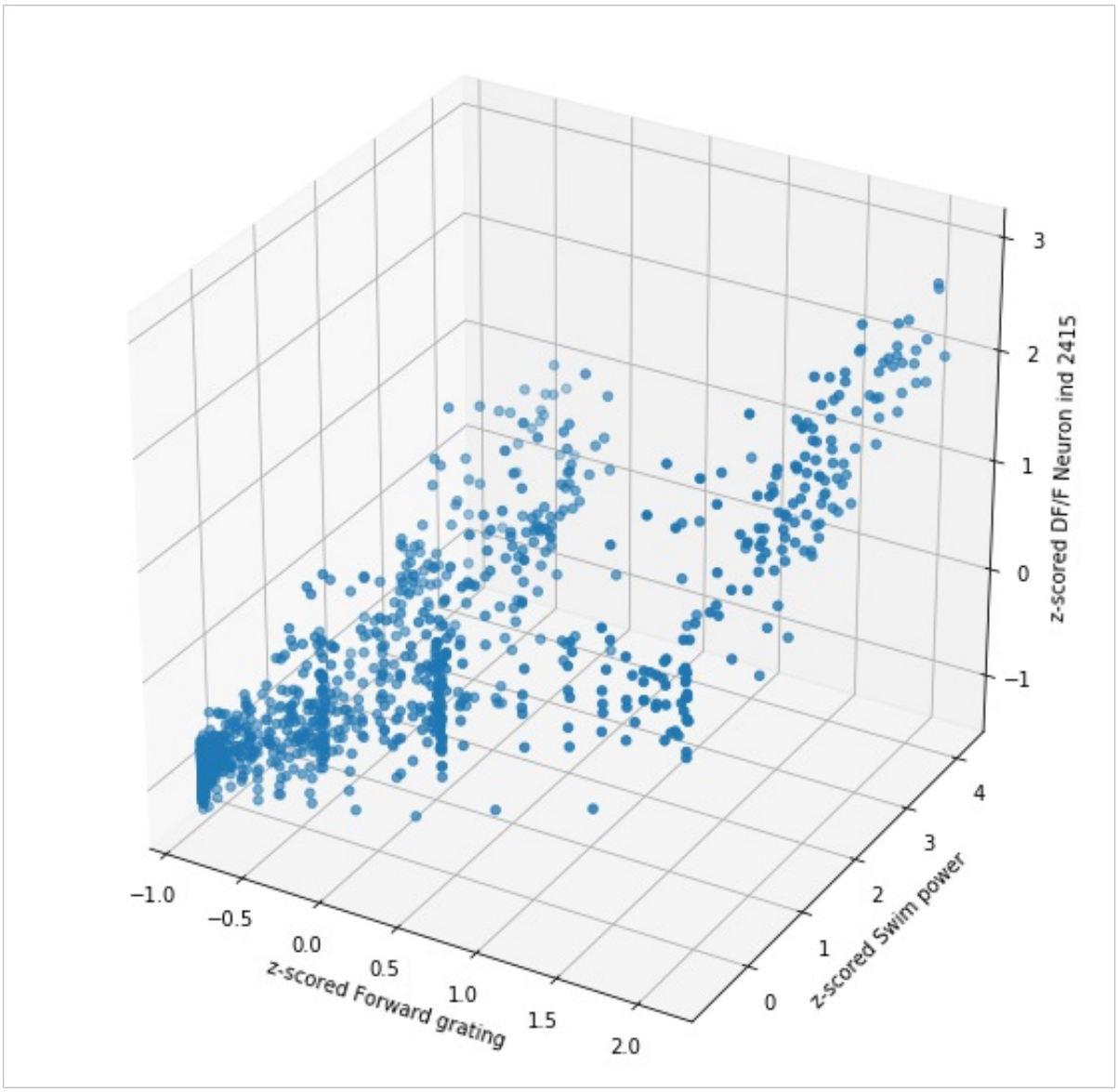
Any other metrics?

- when the response is not linear to the input?
- when the distribution of response or input is skewed?



Quantify the contribution of a neural response from multiple behavioral variables

How to compare the neural response to different contents of behavioral variables, such as gratings and swim?



Quantify the contribution of a neural response from multiple behavioral variables -- Linear regression

How to compare the neural response to different contents of behavioral variables, such as gratings and swim?

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots$$

- use `regress` function doing linear regression on neural activity to behavioral variables (excersie 3.6)
- try different functions in matlab

Discussion: Quantify the contribution of a neural response from multiple behavioral variables

Discussion #1 pairwise correlation vs linear regression

- Similarity
- Dissimilarity
- Pros and cons

Discussion #2 what can be extended in regression?